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ABSTRACT

A study investigated the effects of direct instruction in the process of revision on students' knowledge of the revision process, their ability to make revisions on paper, and the quality of their writing. Subjects, 30 sixth grade students, were divided into an experimental and a control group. The experimental group received instruction in the revision process while the control group read quality literature. After instruction, all subjects wrote a brief story. The next day, subjects were given an opportunity to revise their stories and to write another draft. Experimental group subjects were interviewed about potential revisions while control group subjects received no advice. The main variables analyzed were the number of areas suggested for revision, the average specificity of suggested changes, the total number of revisions made, and the quality scores obtained for the first and final draft. Results indicated that instruction did affect knowledge of the revision process and enhance revision efforts. Specifically, findings showed (1) that when compared to the control treatment, direct instruction in the process of revision did affect aspects of sixth graders' knowledge of the revision process; (2) that the instruction affected efforts to make revisions on paper, though there were no differential effects on types of revisions made; and (3) that the revision instruction affected the quality of the children's stories across drafts--judgments of quality for the experimental group increased substantially, while the same judgments for the control group remained relatively stable. (Six pages of references are included.) (JD)

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Teaching Children about Revision in Writing

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Abstract

The study investigated effects of instruction in the process of revision on children's knowledge of the revision process, on their ability to make revisions on paper, and on the quality of their writing. Fifteen sixth graders received instruction in the process of revision while 15 others read good literature. After instruction, each child wrote a story, was interviewed about potential revisions, and was given an opportunity to make changes on the first copy and then to write another draft. The main variables for knowledge of the revision process were number of spots suggested for revision and average specificity of suggested changes; the main variable for ability to make revisions on paper was total number of revisions made; a quality score was obtained for the first and final drafts. Instruction did affect knowledge of the revision process, and it enhanced revision efforts. Quality judgments tended to increase across drafts for the revision group, whereas they remained stable for the other group.

Teaching Children about Revision in Writing

The present study investigated the possibility that direct instruction in the process of revision would affect (a) children's knowledge of the revision process, i.e., their ability to detect mismatches between intended and instantiated text and to know how to make desired changes, and (b) their ability to make revisions on paper. The study also explored the extent to which the special instruction in revision affected the quality of writing.

The term "revision" is defined in different ways in the literature on writing (Emig, 1971; Murray, 1978; Nold, 1979; Scardamalia & Bereiter, 1983; Sommers, 1980) or, more often than not, it is not defined at all. The definition of revision used in the present study evolved out of the literature on cognitive processes in writing, especially work on writing as a problem-solving process (Beach, 1984; Flower & Hayes, 1981; Hayes & Flower, 1980; Scardamalia & Bereiter, 1983). Specifically, revision was defined as follows:

> Revision means making any changes at any point in the writing process. It is a cognitive problem-solving process in that it involves detection of mismatches between intended and instantiated texts, decisions about how to make desired changes, and making the desired changes. Changes might or might not affect meaning of the text, and they might be major or minor. Also, changes might be made in the writer's mind before text is written on paper, while text is written, and/or after text is written (cf., Beach, 1984; Bridwell, 1980; Faigley & Witte, 1981; Flower & Hayes, 1981; Nold, 1981; Scardamalia & Bereiter, 1983, 1986).

Also, in the present study, revision was viewed as recursive and integrated with other aspects of writing (e.g., planning and evaluating).

Revision is generally regarded as an important aspect of the writing process (Lowenthal, 1980; Murray, 1978; Scardamalia & Bereiter, 1986) partly because it can affect writers' knowledge. Expert and well-known authors often testify that they learn what they are trying to say as they write and revise (Odell, 1980). Some believe that "knowledge consists of propositions constructed by the knower" (Scardamalia & Bereiter, 1986). That construction most likely entails revision or reprocessing of ideas or information. Thus, teaching students to value revision and to revise with greater ease holds promise for promoting learning.

Revision also tends to be regarded as important partly because it might improve compositions. Findings on the relationship of revision to quality suggest that generally, for high school age and older or more skilled writers, revision appears to improve the quality of compositions (Ash, 1983; Bamberg, 1978; Bracewell, Scardamalia, & Bereiter, 1978; Bridwell, 1980). However, some limited evidence suggests that for younger or less competent college writers, revision may have no effect, or even a negative effect, on quality (Bracewell, Scardamalia, & Bereiter, 1978; Perl, 1979). Possibly, younger students either can not or do not reprocess higher level networks of goals and central ideas (Scardamalia & Bereiter, 1986) which may be crucial to affecting quality.

Empirical evidence is sparse regarding the process of revision in general and the problem-solving view of revision specifically. There is some indication that the problem-solving view of revision is not used spontaneously by children (Scardamalia & Bereiter, 1983). Also, children may be able to identify goals

and intentions for their texts but may have difficulty pinpointing mismatches between intended and written text, knowing how to make the change, and carrying it out (Scardamalia & Bereiter, 1983; Sommers, 1980). Another explanation for the breakdown in the problem-solving process of revision is that children have the separate required abilities, but lack executive mental control to tie it all together (Scardamalia, Bereiter, Gartshore, & Cattani, 1980).

Other evidence suggests that children and high school students do not revise much (Graves & Murray, 1980; Scardamalia, 1981; Stallard, 1974), but that there may be developmental trends in revision, with older students making increasingly more meaningful and style-oriented revisions that younger ones (Faigley & Witte, 1981; National Assessment of Educational Progress, 1977).

Though some students might profit from instruction in the process of revision (cf., de Beaugrande, 1983; National Assessment of Educational Progress, 1977; Sommers, 1980), such instruction may be neglected in classrooms (Hoetker & Brossell, 1979; Pipman, 1984; Shaw, Pettigrew, & van Nostrand, 1983; Squire & Applebee, 1968), and intervention studies in revision are rare, especially with young students. Intervention studies in revision have included (a) facilitative efforts, i.e., supporting writers by cueing them about their products or about aspects of revision and (b) giving teacher or peer feedback or giving directions to revise. Direct instruction efforts, i.e., telling about and showing writers the revision process, were not found.

An example of a facilitative procedure was requiring students to execute a problem-solving routine for revision by having them read a piece and stop, either sentence-by-sentence or after large text portions, to evaluate, diagnose, choose a tactic, and carry out the operation (Cohen & Scardamalia, 1983;

Scardamalia & Bereiter, 1983, in press). Evaluation and diagnosis was simplified by providing students a fixed set of responses to choose from. Another type of facilitative effort was naturalistic classroom support using questioning, conferencing, having dialogues, and providing lots of opportunity to write and revise (Graves, 1978).

Facilitative efforts have reportedly been effective in: (a) substantially enhancing primary grade children's revision activity (Calkins, 1979, 1980a, 1980b; Graves, 1978); (b) helping elementary grade children to make appropriate evaluations of their work as compared to evaluations made by professionals (Scardamalia & Bereiter, 1983, in press); (c) eliciting higher level revisions than normal from elementary grade children (Scardamalia & Bereiter, 1983, in press), and (d) in at least one case, enhancing overall quality of children's texts as well as quality of individual revisions (Cohen & Scardamalia, 1983).

Results of studies on the effects of giving teacher or peer feedback and of directions to revise are mixed. Some studies report positive effects (Buxton, 1959; Hillocks, 1982; Kamler, 1980; Maize, 1952; Matsuhashi & Gordin, in press; McColly & Remstad, 1963; West, 1967). Others report no effect (Hansen, 1978; Newman, 1982; Vukelich, 1985).

In sum, although revision is highly regarded as an important part of writing, children do not revise much, schools appear to do little to foster it, and intervention studies, particularly direct instruction studies, are rare. It would appear to be important now to explore the effects on revision of intervention through direct instruction.

The present study used direct instruction in the problem-solving process of revision, in an attempt to affect sixth graders' facility with revision, i.e.,

their knowledge about how to revise (ability to identify discrepancies between intended and instantiated text and to know how to make desire changes) and their ability to carry out revision operations. The special instruction in revision was compared to a control group which read good literature. Literature may serve as a model of good written communication and style (cf., Blake, 1971). Educators generally expect that reading good literature is likely to have a positive effect on writing (cf., Smith & Dahl, 1984; Stewig, 1980), and some research supports the belief (Stotsky, 1983). Consequently, it seemed plausible that reading good literature might have particular impact on the quality of students' writing.

Method

Design

The present study used a post-test only design. Thirty sixth graders were randomly assigned (counterbalancing for Language Arts teacher, sex, and race) to one of two treatments, an experimental group which received special instruction in the process of revision or a control group which read good literature. Thirteen 45-minute lessons were conducted over one month. At the end of the month, each child wrote a story one day, was interviewed about potential revisions the next day (cf., Beach & Eaton, 1984; Scardamalia & Bereiter, 1983), and, on a following day, was given an opportunity to make changes on the first-day copy and then to write another draft on new, clean paper (cf., Bridwell, 1980).

The main variables (extracted from the interviews) for children's knowledge of the revision process (i.e., ability to detect mismatches between intended and written text and to know how to make desired changes) were number of spots

suggested for revision per 100 stage 1 words and the average specificity of suggested changes, respectively. The main variable (extracted from the children's written stories) for ability to make actual changes on paper was total number of revisions per 100 words. ("Revisions-made" variables were obtained at each of four stages in the children's writing: stage 1, in-process revisions on the first day of writing; stage 2 [on the second day], new revisions marked on the first day's draft; stage 3 [also on the second day], revisions made between the revised marked first day's draft and a final draft on a new paper [but before in-process revisions]; and stage 4 [also on the second day], in-process revisions on the final draft.) A quality score was obtained for the written products for stage 1 and again for stage 4.

Thus, for the lead analyses, each subject had two scores covering the first two aspects of the revision process (i.e., ability to detect mismatches between intended and written text and to know how to make desired changes); four scores (one at each of the four stages) for ability to make the change; and two quality scores (one at each of two stages).

When significant effects were found in lead analyses, some follow-up variables were analyzed to further specify the nature of effects. Seven follow-up variables (obtained from the interviews) for knowledge of the revision process were: average degree to which goals for particular revisions were specified; number of suggested surface changes, meaning changes, additions, deletions, substitutions, and rearrangements, each per 100 stage 1 words. Five follow-up variables (obtained from each of the four stages of the writing task) for ability to make the actual changes on paper were number of: surface changes, meaning changes, additions, deletions, and substitutions, each per 100 words.

Subjects

Subjects were 30 sixth graders identified by their teachers as "average writers" for their age and as writers who typically did not revise much. They were selected from two homogeneously grouped Language Arts classrooms which the school designated as the "average" groups. All children in both classes returned parental permission slips. Each teacher rank ordered the students in her own class from those most likely to profit from instruction to those least likely to profit. The 15 highest ranking students in each class were then selected for the study. There were 17 males and 13 females, 13 black, 16 white, and one Indian student. Students were distributed roughly evenly by gender and race across the two treatment groups. The average end-of-fifth-grade percentile on the California Achievement Test (CTB/McGraw-Hill staff, 1977) for Language for the revision group (79.75, with a standard deviation of 8.59) was not significantly different from the average for the other group (82.67, with a standard deviation of 10.18).

Instruction

Two trained doctoral students taught both treatment groups (in a counterbalanced fashion) and were monitored daily through direct observation by one of the investigators or through tape recordings of lessons which were reviewed the same day. The investigator's observations were counterbalanced.

So that potentially intervening variables could be controlled, insofar as possible, the following factors were equated for the two groups: instructional time, broad content area of instruction (Language Arts), format of instruction, amount of practice writing, amount of opportunity to revise one's own writing, and type and amount of teacher feedback. Also, the same selections from good

literature were used in both groups. Portions of selections were used in the revision instruction group as material (sometimes modified by the researchers) for demonstration and/or application of the revision process after hearing other portions summarized, while the control group read the good literature silently.

There were four three-day cycles of 45-minute lessons. A thirteenth lesson provided a summary of the previous 12 sessions. In the revision group, each cycle focussed on one kind of revision, i.e., additions, deletions, substitutions, or rearrangements, respectively. Each kind of revision was defined as Faigley and Witte (1981, 1984) define it, but easier terms were used.

The instruction for the revision group centered on teaching revision as a problem-solving process, i.e., detecting mismatches between intended and instantiated texts, deciding how changes could or should be made, and actually making changes. On the first day of each cycle, there was an overview and review using charts. For example, the teacher referred to a chart that described aspects of the revision process, and on day one of cycle one, she also used charts to define and discuss additions. Next, the teacher modelled the revision process, thinking aloud and pointing to the chart describing the problem-solving view of revision while making revisions on a transparency. Finally, the teacher led the group in revision of an example. On day two, there was an overview and review. Then in pairs, the children practiced revising a portion of text by using a handout which led them through the problem-solving process of revision. Finally, they wrote a brief story. On day three, there was an overview and review. Then children individually revised a section of a story supplied by the teacher. Finally, they were given an opportunity to revise the

story they had written the day before. Throughout all lessons the children were encouraged to understand and use revision as a problem-solving process.

The other group's lessons revolved around reading good literature. Selections from the Random House (Goodman, 1980) Spotlight on Literature series were used, including for example, Frank Stockton's "The Lady or the Tiger" (adapted) and O. Henry's "After Twenty Years" (adapted). The readability levels (Fry, 1977) ranged from second to fourth grade. In each cycle, on day one there was an overview and review, followed by silent reading of a selection of good literature, and ending with group discussion which was facilitated by the teacher as needed. On day two, there was an overview and review. Then in pairs, students read good literature selections orally. Finally, the students wrote a brief story. On day three, there was an overview and review. Then students wrote what they liked and did not like about the stories, and finally they had an opportunity to revise the story they had written the day before.

Interview and Writing/Revision Tasks

Interview. One of the investigators and a trained doctoral student conducted the interviews with students individually. The interviews were tape recorded and later transcribed. The interviewer gave the student the story which had been written on the previous day and asked the student to read it over silently while the interviewer did the same. Then the interviewer asked questions designed to reveal students' knowledge of the revision process, i.e., knowledge about mismatches between intended and instantiated text and about how to make desired changes. Each student was asked: Is there anything that could or should be changed in your story? If the student said "No," the interviewer repeated the question. If the response was still negative, the interview ended.

If the response was "Yes," the student was asked to show the part or parts that could be changed. The indicated part was identified by a number on a copy of the story while the interviewer said the number aloud and read accompanying information from the text so that it was recorded in the transcription as well. If the indicated spot was unclear, the interviewer prompted the student until the interviewer understood what was being indicated. Then for each spot indicated, the interviewer asked: Why do you think this could or should be changed? Prompts were: What do you want me, the person reading it, to know or feel here by making that change? What are you trying to tell me here at this point by making this change? Next, the interviewer asked: How could or should it be changed? After the student had fully responded regarding the first indicated change, the interviewer said, "Is there anything else in the story you think could or should be changed?" If the student said "Yes," the interview procedure was repeated until the student indicated there were no more desired changes. If the student said, "No," the interview ended.

Writing/revision. Procedures for the writing/revision task were similar to those used by Bridwell (1980) and Faigley and Witte (1981). On the first day of the post-instructional sessions, the students were given blue pens and lined paper and asked to write the best story they could for someone else to read. A three-minute period was given during which the children could jot down ideas, words, and phrases. Next they were told to take a few minutes to plan and organize their stories (using the same sheet of paper), and then when ready, to write the stories on a new clean sheet of paper. Thirty minutes were given for writing. On a following day, the children's papers were returned to them, and they were given black pens. They were reminded that the stories should be good

stories for someone else to read and told to a) reread the story, b) make any desired changes on the original paper, and c) write another draft of the story on a new clean paper. Forty minutes were given.

Stage 1 revisions were "in-process" changes made in blue ink while writing on day one. Stage 2 revisions were "between-draft" changes made in black ink on the first day's draft (in blue ink). Stage 3 revisions were "between-draft" changes made between the end of the revised marked first day's draft and the black ink version on new paper (excluding revisions marked in black ink). Stage 4 revisions were "in-process" revisions made in black ink on the final draft (also in black ink).

Variables, Their Sources, and Scoring Procedures

Knowledge about the revision process. Two aspects of knowledge about the revision process were addressed: ability to detect mismatches between intended and instantiated text and ability to know how to make desired changes. To address instructional effects on ability to detect mismatches between intended and instantiated text, a lead variable and a follow-up variable were formed using information from the interviews. The lead variable was the number of spots suggested for revision per 100 stage 1 words. The follow-up variable was the average specificity of goals for particular revisions. For each spot identified for revision, there was a score of 0 for no goal given, 1 for a vague goal, and 2 for a specific goal.

To address instructional effects on ability to know how to make the desired changes, a lead variable and six follow-up variables were formed from information given during the interviews. The lead variable was the average specificity of suggested changes. For each spot identified for revision there

was a score of 0 for no suggestion given for how to make the change, 1 for a vague suggestion, and 2 for a specific suggestion. (Only the first suggestion given for each spot identified was scored.) The follow-up variables (all per 100 stage 1 words) were number of suggested: surface changes, meaning changes, additions, deletions, substitutions, and rearrangements. (No distributions or consolidations were suggested.)

Interrater agreement between one of the investigators and a trained undergraduate student for locating in the transcripts goal statements and parts of interviews that discussed each change were .86 and .90, respectively. Reliability, estimated by Pearson correlations for scores from the same investigator and undergraduate student, ranged from .74 to 1.00 for the interview variables. (A few correlations could not be computed because non-zero cases were scarce.)

Ability to make revisions on paper. Using Faigley and Witte's (1981, 1984) classification scheme for revision, one lead variable and five follow-up revisions-made variables (all per 100 words) at each stage were formed from the writing/revision task. The lead variable was total number of revisions. The follow-up variables were number of: surface changes, meaning changes, additions, deletions, and substitutions. (No rearrangements, distributions, or consolidations were made.)

Interrater agreement between the two investigators for locating revisions in the children's texts was .76. Reliability for number of words, estimated by Pearson correlations between one of the investigators and a trained undergraduate student was .99. Reliabilities for the revisions-made variables, estimated by Pearson correlations between the two investigators, ranged from .71

to .99. (A few correlations could not be computed because non-zero cases were scarce.)

Quality. To address instructional effects on the quality of writing, a quality score was used for the written texts for stage 1 and again for stage 4. Following Bridwell's (1980) procedures, protocols from stages 1 and 4 were typed so that they remained as true to the handwritten versions a possible. Two trained doctoral students scored the typed stories previously arranged in a random order using an analytic scale which was based on the work of Diederich (1974) and Beach (1979). Eight subscores (sequence, story development, organization, word choice, details, flavor, sentence structure, and punctuation), each scored from one to six, summed to yield a total score, with a possible range of eight to 48.

Cronbach's coefficient alpha was .76.

Results

Analyses

Two phases of analyses were conducted. These were three lead analyses and a few follow-up analyses to further specify effects. Lead analyses were: (a) To address instructional effects on children's knowledge of the revision process, a multivariate analysis of variance was done using the lead variables number of spots identified for revision per 100 stage 1 words and average specificity of suggested changes. (b) To address instructional effects on children's ability to make desired revisions on paper, a repeated measures analysis was done using the lead variable total number of revisions made per 100 words, one score at each of four stages of the writing/revision task. (c) To address instructional effects on quality of writing, a repeated measures

analysis was done using the lead variable, quality, one score at stage 1 and one at stage 4.

Where significant effects were found in the analyses with the lead variables, analyses of variance and repeated measures analyses were conducted using the follow-up variables to try to further specify the nature of the effects.

Each analysis is specifically described with accompanying results in the following sections. For the repeated measures analyses, procedures outlined by Bock (1975) and Finn and Mattsson (1978) were followed.

Preliminary Correlations among Variables

To explore relationships among variables prior to conducting analyses of instructional effects, subgroup correlations among key variables were computed. While interpreting the correlations it is important to keep in mind that the very small sample size may have produced spurious correlations and that the correlations were not done at each of the four revision stages, so differences in relationships across stages may be masked. The correlations (shown in Table 1) reveal similar patterns across the two groups, and three broad statements may be made about the patterns: (a) Knowledge of revision tended to be linked to amount of revision carried out. On the whole, those who identified more discrepancies between intended and instantiated text and who were more specific about how to make desired changes tended to carry out more revision operations. (See correlations in the second column of figures in Table 1). (b) On the whole, there was no relationship between knowledge of revision and quality of the finished piece. It is noteworthy that, though generally not significant, correlations tended to be in a negative direction. (See the first, second,

fourth, and fifth correlations in the last column in Table 1). (c) There was no relationship between amount of revision and final judgments of quality of writing. (See the third and sixth correlations in the last column.)

Insert Table 1 about here.

Knowledge of the Revision Process

The instruction did affect children's knowledge of the revision process, i.e., the ability to detect mismatches between intended and instantiated text and the ability to know how to make desired changes. There was a significant treatment effect in a one-way multivariate analysis of variance in which treatment was the independent variable, and the dependent variables were number of spots suggested for revision per 100 stage 1 words and average specificity of suggested changes, $F(2, 27) = 2.39$, one-tailed $p = .05$.

Ability to detect mismatches between intended and written text. The instruction did affect children's ability to detect mismatches between intended and instantiated text. Accompanying the multivariate analysis described above, the univariate $F(1,28)$ for number of spots suggested for revision per stage 1 100 words was 2.88, with a one-tailed p of .05. Though the difference between groups was not dramatic, Table 2 shows the revision group suggested significantly more spots for revision per 100 words (1.54 on the average) than did the other group (.86 on the average).

Insert Table 2 about here.

A follow-up analysis was done to see if the ability to detect mismatches between intended and instantiated text might be linked to an effect on the ability to specify goals or intentions for particular revisions. Among those who detected mismatches, there was, however, no significant difference between groups for the average degree to which goals for particular revisions were specified. A one-way analysis of variance in which treatment was the independent variable and degree of specificity of goals was the dependent variable revealed no significant effect. Table 2 shows the average degree to which goals were specific was between vague and specific (1.50) for the revision group and close to vague (1.17) for the other group.

Ability to know how to make desired changes. The instruction did affect the children's ability to know how to make desired changes. Accompanying the multivariate analysis described above, the univariate F (1, 28) for the average specificity of suggested changes was 4.28, with a one-tailed p of .02. Table 2 shows the mean for the revision group was 1.60, or closer to specific. For the other group it was 1.01, or closer to vague.

Follow-up analyses were done to see if there were instructional effects on knowledge about how to make different types of changes such as surface or meaning changes, or additions, deletions, substitutions, or rearrangements. There was a differential effect of treatment on number of surface versus meaning changes suggested. A repeated measures analysis of variance showed a significant interaction for treatment by type of revision, F (1, 28) = 3.96, p = .05. The repeated measures analysis of variance used treatment as the between subject factor and type of revision suggested (surface and meaning) per 100 stage 1 words as the within subject factor. Though Tukey post hoc tests showed

no specific pairs of means to be significantly different, the revision group suggested over twice as many meaning changes (1.06 per 100 words, on the average) as surface ones (.31 per 100 words on the average), while the other group suggested roughly the same number of meaning (.38 per 100 words on the average) and surface (.43 per 100 words, on the average) changes. (See Table 3.)

Insert Table 3 about here.

There was no instructional effect on how many additions, deletions, substitutions, and rearrangements children suggested. (Means and standard deviations are shown in Table 3.) There were no significant effects in a repeated measures analysis of variance in which treatment was the between subject factor and type of revision suggested (addition, deletion, substitution, and rearrangement) was the within subject factor.

Ability to Make Revisions on Paper

The instruction did affect children's ability to make revisions on paper. There was a significant treatment effect in a repeated measures analysis of variance in which treatment was the between subjects factor, stage (1, 2, 3, and 4) was the within subjects factor, and the outcome variable was total number of revisions made per 100 words, F (1, 28) = 6.74, p = .01. The revision group exceeded the other group on the total number of revisions made per 100 words, averaging 2.36, 5.30, 14.44, and 1.14 revisions per 100 words at stages 1, 2, 3, and 4 respectively, compared to 1.40, 3.03, 11.02, and .79, respectively.[1] (See Table 4.)

Insert Table 4 about here.

Follow-up analyses revealed that the instruction did not affect use of certain types of revisions more than others. There were no significant treatment effects for use of meaning versus surface operations or for use of additions, deletions, or substitutions. (See Table 4 for means and standard deviations.) Two repeated measures analyses of variance were done in which treatment was the between subject factor, stage was a within subject factor, and type of revision suggested (either surface and meaning or addition, deletion, and substitution, respectively) was a within subject factor.

Several additional interesting results that held across both treatment groups emerged from the analyses of revisions-made variables. First, on the average, across both groups, there were significant differences between stages. Most often, revisions at stage 3 exceeded all others. (Table 4 shows within-group means and standard deviations by stages. Where useful, marginal means are reported in the text below.) The relevant significant effects for the models with the following respective outcome variables were:

total number of revisions per 100 words, for stage, F (3, 26) = 45.94, p = .01, with overall means for stages 1, 2, 3, and 4 of 1.80, 4.17, 12.73, and .97, respectively, and Tukey's HSD (8, 112) = 3.18;

number of surface and number of meaning changes, each per 100 words, for type (surface and meaning changes) by stage (1, 2, 3, and 4) interaction, F (3, 26) = 9.86, p = .01, with the same overall means and Tukey's HSD as for total number of revisions per 100 words; and

number of additions, deletions, and substitutions, each per 100 words, for stage, F (3, 26) = 33.34, p = .01, but here, more of these kinds of revisions were made at stage 3 (overall mean = 7.30) than 2 (overall mean = 3.05), which in turn was significantly higher than 1 (overall mean = 1.02) and 4 (overall mean = .18), HSD (24, 336) = .64.

Second, for both groups, surface and meaning changes were used differentially across stages. The number of surface changes considerably exceeded the number of meaning changes at stage 3. In the model using number of surface and meaning changes each per 100 words, there were significant effects for the type (surface and meaning) by stage interaction, F (3, 26) = 9.86, p = .01, for stage, F (3, 26) = 45.92, p = .01, and for type of revision (surface and meaning), F (1, 28) = 19.87, p = .01. Table 4 shows the within-group means for surface and meaning changes. The overall marginal means at stages 1, 2, 3, and 4, respectively for surface changes were 1.24, 2.09, 8.73, and .65; the counterpart means for meaning changes were .64, 2.08, 4.01, and .32. Only the number of surface changes exceeded meaning changes at stage 3, HSD (16, 224) = 2.23.

Quality

There were differential effects of instruction on quality across revision stages. There were significant effects for treatment by stage and for stage in a repeated measures analysis of variance in which treatment was the between subject factor, stage (1, 4) was the within subject factor, and the outcome variable was quality, F (1, 28) = 5.15, p = .03, and F (1, 28) = 3.96, p = .05, respectively. Though post hoc Tukey tests for the interaction showed no

significant differences between specific pairs, the means indicated that the revision group wrote slightly lower quality first drafts than did the other group, but there was a tendency towards improvement in quality from stage 1 to stage 4 for the revision group (24.13 and 30.27, respectively, with standard deviations 7.76 and 8.74), while the other group's stories were judged to be of approximately the same quality at both stages (27.67 and 27.27, respectively, with standard deviations 9.24 and 10.08).

Conclusions and Discussion

Three sets of conclusions may be made. (a) When compared to a control treatment, direct instruction in the process of revision did affect aspects of sixth graders' knowledge of the revision process. The instruction affected ability to identify discrepancies between intended and instantiated text. The revision group suggested more spots for revision than did the other group. The instruction also affected the children's knowledge of how to make desired changes. The revision group made slightly more specific suggestions than the other group about how desired changes might be made, and the revision group suggested roughly twice as many meaning changes as surface ones, whereas the other group suggested about an equal number of meaning and surface changes.

(b) The instruction affected efforts to make revisions on paper. When compared to the other group, the revision group made more revisions. However, there were no differential effects on types of revisions made (for either meaning and surface or additions, deletions, and substitutions).

(c) Finally, the revision instruction affected quality of the children's stories across drafts. Judgments of quality for the revision group tended to increase from stage 1 to 4, whereas the same judgments for the other group

remained relatively stable. However, judgments of final draft quality across the two groups were not significantly different on the average.

The findings of the present research do support the utility of direct intervention in revision in writing in the classroom. Coupled with other prior intervention results, the present findings substantiate the possibility that young writers' knowledge about revision and their revision efforts can be enhanced. Further, effects can occur within a relatively short time frame.

Several findings may be compared to tabulations of numbers and types of revisions in previous research on the process of revision. Interestingly, counts of total number of revisions per 100 words indicate that the sixth graders in the present study did do a fair amount of revising (23.19 revisions per 100 words for the revision group and 16.29 for the other group) when compared to twelfth graders (33.80 revisions per 100 words) (Bridwell, 1980), college students (28.20 for advanced college students, 17.30 for inexperienced college students) (Faigley & Witte, 1981), and professional adult writers (14.5 per 100 words) (Faigley & Witte, 1981). Each of the former studies counted in slightly different ways, but clearly, the figures were not dramatically different. It might be said that the range of 14 to 34 revisions per 100 words (seen across the various reports) is not a lot of revision, but even so, the sixth graders did appear to be doing relatively more revision than was anticipated.

The ratio of meaning changes to surface ones in the present study was high and on a par with expert adult writers in Faigley and Witte's (1981) work. Each group in the present study and the expert writers in Faigley and Witte's (1981) study made approximately one meaning change for every two surface changes. The

sixth graders' comparative competence in making meaning changes is quite surprising and unexpected, and is difficult to explain.

Also, in the present study, generally, the most revisions occurred at stage 3, a between-draft stage, where changes not noted on the previous paper were made when the next draft was written. Faigley and Witte (1981) reported a similar finding with college and adult writers, but Bridwell (1980) reported that her twelfth graders did more in-process revisions than between-draft revision. The discrepancy in results may be due to subjects' age differences, but more likely is due to methodological differences between studies in identifying between-draft and in-process revisions. The results of the present study and of Faigley and Witte's (1981) study lend support to the view that a considerable amount of revision can take place in writers' minds as they evaluate former drafts and plan for next drafts.

The instructional effect on the number of suggested meaning versus surface changes was important. However, although the revision group suggested they would make proportionately more meaning than surface changes (when compared to the other group) the intentions were not carried out; the revision group did not make proportionately more meaning than surface changes when compared to the other group. It is possible that the revision group children could see and talk about needs for meaning changes but lacked the writing or organizational skills needed to get all of them into print. Also, meaning changes may require more time and energy than surface changes. Perhaps the children were unwilling to expend the necessary effort.

It is also important to note that the instruction did not affect children's ability to specify goals for revision. Several explanations are possible.

First, Scardamalia and Bereiter (1983) and Sommers (1980) found that children and older students were fairly capable of identifying goals and intentions for their texts. The most welcome of the possibilities then is that the instruction in the present study had no effect on children's ability to specify goals for revision because they were already doing it about as well as could be expected. Second, though the lessons were designed to require children to think about their goals and intentions, it did not specifically teach them how to specify or formulate goals. It may, in fact, be incredibly difficult to teach children to specify goals. A third possibility is that the interview method used in the present study did not allow all goals to surface. Children may not have been able to or chose not to articulate all the goals they had. Finally, the writing task used in the study may have artificially depressed specification of goals for revision. Young writers may find goal identification easier in "real life" writing in which audience and purpose for writing are self-selected and potentially more relevant to them, and therefore goals for revision would be clearer.

The instructional effect on quality across drafts is noteworthy, but is difficult to interpret when juxtaposed against the nonsignificant and negative trend across preliminary correlations of quality with knowledge of revision and revisions-made variables. First, it is noteworthy that though not significant, at stage 1, the revision group's writing appeared to be lower (on the average) in quality than the other group's, and at stage 4, though not significant, it appeared to be higher. A possible interpretation of this result is that the two groups came to view the process of writing and the purposes of respective drafts differently. Perhaps the revision group believed that a first draft does not

have to be polished and that reworking the piece is an opportunity rather than a chore. If this interpretation is valid, and if there is value in viewing writing as a recursive process of meaning construction, then the instructional effect on quality across drafts would appear to have some educational significance. Further, the presence of an instructional effect on quality across drafts favoring the revision group may be underscored when one considers the nature of the control group treatment since educators usually expect reading good literature can have a positive effect on writing.

Next, the correlations do fit the pattern found in prior research wherein the revisions of children and less competent writers have tended to have no effect or a negative effect on quality (Bracewell et al., 1978; Perl, 1979), though positive relationships between revision and quality have been found for older or more skilled writers (Ash, 1983; Bamberg, 1978; Bracewell et al., 1978; Bridwell, 1980). The developmental pattern of correlations using quantitative variables such as the ones used in the present study may mask a complex relationship between revision and quality. Probably the critical aspect of revision with regard to quality is not merely how much is done or how many revisions are made, but what is done or which revisions are made. Possibly, older and more competent writers are more able to make better decisions about what to revise, and counts of how much revision takes place might be confounded with "goodness" of what takes place.

Finally, the nonsignificant and negative trend among correlations of revision variables and quality might also be considered in relation to the finding that the revision group and the other group did not differ significantly on quality of writing for the final draft. The result is not surprising in that

it is probably difficult to affect judgments of quality in intervention studies which focus on one aspect of writing. Many factors (such as organization or word choice) contribute to judgments of quality, and it seems unlikely that instruction in any one of those factors alone might produce dramatic effects on quality. Intervention studies in revision, in fact, would not even focus on specific dimensions subsumed in judgments of quality. Also, it seems unlikely that short-term instruction would have a significant impact on overall quality of writing.

It is also probably difficult to affect judgments of quality of final drafts in intervention studies in revision which do not stress the link between writing and audience. Judgments of quality are made from readers' perspectives, not writers' perspectives. To affect quality, writers must make a piece fit readers' expectations or judgments or be able to jar the readers' expectations or judgments in such a manner that the reader can interpret the jarring as creative or at least acceptable and understandable. Therefore, an important factor in the relationship of revision to quality is likely to be the degree to which authors' changes make the piece fit readers' expectations better. The focus of the present study was on helping children to bring their writing into line with their own expectations or intentions, not necessarily with readers' expectations. Though audience was considered during the instruction in the present study, the issue of fit to audience was not a major component of instruction. Children received no instruction or support with regard to which changes should be made. In other words, the outer shell or layer surrounding writing, i.e., audience anticipation, expectation, or receptivity, was not a major part of instruction in this study. If quality is to be dramatically

affected, facets of that shell probably need to be stressed in instruction.

The findings of the present study should be considered in light of at least four limitations. First, though the study did tap aspects of revision at several points in the writing process, it did not measure any affects on mental revisions that may have occurred before pen met paper.

Second, the prospective interview procedure was used because it was thought of as a good way to tap students' knowledge and thinking about revision, but it may not have yielded a complete picture of children's goals and intentions or their diagnostic and evaluative abilities. One indication of the shortcomings of the interview method was that the children actually made more revisions than they suggested they would make during the interviews. Also, it was not possible to link suggestions from the interviews with specific post-interview stages of revision. Interview remarks could forerun changes made at stages 2, 3, or 4. One future alternative to the present methodology might be to interview children after revisions have been made, and then ask them about the specific revisions they made. Another possibility would be some form of oral protocol analysis using think-aloud writing. Comments regarding goals and intentions, discrepancies between intended and instantiated text, and so forth, could be collected and students' follow-through on intentions could be traced.

Third, the instruction consisted of several components and does represent a sort of "package." It is not possible to tell which components directly contributed to the significant results. For example, perhaps instruction in kinds of revision (addition, deletion, etc.) alone without a stress on the process of revision would produce similar results.

Fourth, though there were multiple drafts, only one composition was secured

as an outcome sample. It is not possible to know the extent to which the results of the study are generalizable across various pieces.

In conclusion, direct instruction in the process of revision appears to hold promise as a means of helping young children to acquire knowledge about how to revise, to enhance their revision efforts, and potentially to affect the quality of their writing. It may also help youngsters to develop a problem-solving view of revision and writing which could in turn make writing seem easier and more enjoyable. An important future step would be to encase similar instruction in how to revise inside a program aimed at acquisition of knowledge of characteristics of what to revise, i.e., of enhancing knowledge about "good texts."

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Footnotes

[1]The average number of words for compositions was not significantly different across groups at any of the four stages of revision. The revision group wrote averages of 227.40, 219.20, 204.13, and 208.93 words at stages 1 through 4, respectively, with standard deviations of 93.86, 97.94, 85.12, and 86.45, respectively. The counterpart figures for the other group were 221.47, 214.00, 214.47, and 216.07 for means, and 84.52, 83.21, 77.15, and 78.15 for standard deviations.

Table 1

Subgroup Correlations (and One-tailed p Values) among Key Variables

Group	Variable	Variable: Average specificity of suggested changes	Variable: Total number of revisions[b]	Variable: Quality Stage 4
Revision	Number of spots suggested for revision[a]	.33 (.11)	.10 (.35)	-.52 (.02)
	Average specificity of suggested changes		.50 (.02)	-.23 (.19)
	Total number of revisions per 100 words			-.18 (.25)
Reading good literature	Number of spots suggested for revision[a]	.68 (.00)	.50 (.02)	-.40 (.06)
	Average specificity of suggested changes		.54 (.01)	-.00 (.40)
	Total number of revisions per 100 words			-.19 (.25)

[a]Per 100 stage 1 words.
[b]Total across all four stages per 100 stage 4 words.

Table 2

Means (and Standard Deviations) for Number of Spots Suggested for Revision, Average Specificity of Goals for Revision, and Average Specificity of Suggested Changes

Group	N spots suggested for revision[a]	Average specificity of goals for revision	Average specificity of suggested changes
Revision	1.54	1.50	1.60
	(1.30)	(.67)	(.69)
Reading good literature	.86	1.17	1.01
	(.86)	(.89)	(.86)

[a]Per 100 stage 1 words.

Table 3

Means (and Standard Deviations) for Interview Variables for Types of Revisions Suggested[a]

Group	N surface changes	N meaning changes	N additions	N deletions	N substitutions	N rearrangements
Revision	.31 (.46)	1.06 (1.05)	.27 (.49)	.41 (.40)	.25 (.43)	.21 (.44)
Reading good literature	.43 (.69)	.38 (.54)	.22 (.33)	.06 (.16)	.23 (.41)	.01 (.06)

[a]All per 100 stage 1 words.

Table 4

Means (and Standard Deviations) for Total Number and Types of Revision Made [a]

Group	Stage	Total N Revisions	N surface	N meaning	N additions	N deletions	N substitutions
Revision	1	2.36 (2.20)	1.66 (1.47)	.71 (.92)	.09 (.27)	.66 (.99)	.42 (.66)
	2	5.30 (3.03)	2.63 (2.11)	2.67 (1.67)	1.09 (.89)	1.28 (1.25)	1.48 (1.34)
	3	14.44 (7.92)	10.03 (6.34)	4.42 (3.49)	2.91 (2.37)	2.88 (2.51)	2.83 (2.24)
	4	1.14 (1.07)	.71 (.71)	.43 (.53)	.03 (.13)	.37 (.44)	.18 (..39)
	Total	23.19 (8.29)	15.05 (7.02)	8.14 (3.72)	4.08 (2.29)	5.14 (2.67)	4.94 (2.63)
Reading good literature	1	1.40 (1.23)	.82 (.81)	.57 (.72)	.00 (.00)	.52 (.54)	.35 (.58)
	2	3.03 (3.29)	1.55 (2.24)	1.48 (1.77)	.61 (.73)	.95 (1.64)	.69 (1.13)
	3	11.02 (6.04)	7.42 (4.30)	3.60 (3.44)	1.90 (1.95)	1.38 (1.36)	2.69 (2.16)
	4	.79 (.99)	.58 (.73)	.20 (.43)	.03 (.10)	.17 (.33)	.19 (.58)
	Total	16.29 (6.77)	10.41 (5.15)	5.88 (3.85)	2.52 (1.86)	3,01 (2.17)	3.90 (2.27)

[a] All per 100 words.